

# CRS Report for Congress

---

## Received through the CRS Web

### Strategic Airlift Modernization: Background, Issues and Options

Christopher Bolkcom  
Analyst in National Defense  
Foreign Affairs, Defense, and Trade Division

#### Summary

There is a growing consensus that the U.S. strategic airlift fleet provides an increasingly important military capability, and is increasingly stressed. The Department of Defense's (DOD) latest mobility study points to a shortfall in current and projected airlift capability. Several options have been suggested to address this reported shortfall. This report will be updated as events warrant.

#### Background

The ability to project military power over great distances is a central tenet of the U.S. national military strategy and the massive military buildup before Operation Desert Storm (the 1991 war with Iraq) highlighted the value of strategic airlift. U.S. aircraft moved over 500,000 troops and 543,548 tons of cargo.<sup>1</sup> Strategic airlift has also played a key role in recent conflicts. On April 10, 2003, the U.S. Transportation Command reported that it had exceeded its Operation Desert Storm airlift operations by flying 16,213 missions for the most recent war in Iraq, Operation Iraqi Freedom (OIF). Air mobility sorties made up the majority of the 28,500 total sorties that have been flown during OIF,<sup>2</sup> and C-17s executed a much publicized airdrop of the 173<sup>rd</sup> Airborne Brigade into northern Iraq. Other transportation modes, such as sealift, can deploy troops and equipment. The strongest argument for using airlift instead of other modes is speed.

Despite its importance, today's U.S. strategic airlift system is under stress. Over the past 10 years, the United States has reduced its Cold War infrastructure and closed two-thirds of its forward bases. Therefore, to maintain the same level of global engagement, U.S. forces must deploy more frequently and over greater distances. Even prior to the September 11, 2001 terrorist attacks and resulting conflicts, the Air Force estimated that it deployed four times more frequently than when it enjoyed the larger, Cold War

---

<sup>1</sup> *Gulf War Air Power Survey*, vol. V, (Washington: GPO, 1993), p. 76.

<sup>2</sup> Chuck Roberts, "C-130 Crews Keep The Supplies Coming," *Air Force News*, Apr. 16, 2003.

<b>Report Documentation Page</b>			Form Approved OMB No. 0704-0188		
<p>Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p>					
1. REPORT DATE <b>25 MAR 2005</b>	2. REPORT TYPE <b>N/A</b>	3. DATES COVERED <b>-</b>			
4. TITLE AND SUBTITLE <b>Strategic Airlift Modernization: Background, Issues and Options</b>			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Congressional Research Service The Library of Congress 101 Independence Ave, SE Washington, DC 20540-7500</b>			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF: a. REPORT <b>unclassified</b>			17. LIMITATION OF ABSTRACT <b>SAR</b>	18. NUMBER OF PAGES <b>6</b>	19a. NAME OF RESPONSIBLE PERSON
b. ABSTRACT <b>unclassified</b>					
c. THIS PAGE <b>unclassified</b>					

infrastructure.<sup>3</sup> General Charles T. Robertson, former Commanding General of the U.S. Transportation Command, testified that “Bottom line: This nation’s number one defense transportation shortfall is its ailing and numerically inadequate strategic airlift fleet.”<sup>4</sup>

**Strategic Airlift Platforms.** The U.S. strategic airlift force includes the C-5 Galaxy, the C-17 Globemaster, and the C-141B Starlifter. Aerial refueling aircraft also contribute to airlift.<sup>5</sup> The **C-5**, made by Lockheed Martin, is typified by its payload and range. One of the largest aircraft in the world, the C-5 can carry 160,000 lbs of cargo up to 3,730 nautical miles and has a maximum payload of 291,000 lbs. The C-5 can carry large and irregularly shaped cargo, such as the Army’s 74-ton mobile scissors bridge, that no other U.S. aircraft can hold. Both the nose and aft ends of the C-5 open, facilitating rapid loading and off-loading. The C-5 has been plagued by reliability problems; its mission capable rate for 2000 was 58 percent. The Air Force operates 126 C-5s in the active, reserve and national guard forces.<sup>6</sup> The C-5A was first deployed in 1969, and the C-5B, which features upgraded wings and avionics, was first introduced in 1980.

The **C-141B**, made by Lockheed Martin, can carry 68,000 lbs of cargo 2,270 nautical miles. The C-141B is also used to carry out the U.S. Army’s airdrop mission. As of June 2004, only 30 C-141Bs remain in the active inventory. Current plans call for these aircraft to be phased out by 2006.

The **C-17**, made by Boeing, is DOD’s most modern strategic airlifter. Because it can use short and unfinished runways and has high maneuverability on the ground, the C-17 can operate in environments traditionally confined to smaller airlifters like the C-130 Hercules. Thus, the C-17 can deliver its payload from the United States directly to forward bases near the battle. Like the C-5, the C-17 can carry outsize and oversize cargo like helicopters and missile launchers. Its maximum payload is 160,000 lbs which it can carry up to 2,400 nautical miles. Current plans call for the acquisition of 180 aircraft. Air Force officials have said, however, that they require at least 222 C-17s to meet existing requirements.<sup>7</sup>

## Strategic Airlift Requirements

In March 2004, DOD announced that it would initiate the “Mobility Capabilities Study” a new assessment of strategic military airlift requirements. A new study is needed, officials say, to take into account the changing, “post-9-11” security environment, and the

<sup>3</sup> Maj. Gen. Howie Chandler, *Basic Air Force Structure and Expeditionary Aerospace Force (EAF) Operations*, Briefing to U.S. Congressional Air Force Caucus, Mar. 23, 2001, Bolling AFB.

<sup>4</sup> Statement of General Charles T. Robertson Jr., USAF, Commander-in-Chief United States Transportation Command, in U.S. Congress, Senate Committee on Armed Services, Subcommittee on Seapower, *Strategic Airlift and Sealift Imperatives for the 21<sup>st</sup> Century*, 107<sup>th</sup> Cong., 1<sup>st</sup> sess., Apr. 26, 2001, p. 21.

<sup>5</sup> For more on the C-17, see CRS Report RL30685, *Military Airlift: The C-17 Aircraft Program*.

<sup>6</sup> U.S. Air Force Fact Sheet. *C-5 GALAXY*. [<http://www.af.mil/factsheets/>]

<sup>7</sup> Amy Butler, “Lawmakers Accuse Air Force of Financial ‘Slight of Hand’ In C-17 Contract,” Defense Daily, June 15, 2004.

air mobility lessons learned from Operations Enduring Freedom (Afghanistan) and Iraqi Freedom. The Mobility Capabilities Study should be published in April 2005.

In March 2001, the Air Force's Air Mobility Command (AMC) released an unclassified summary of its Mobility Requirements Study 05 (MRS-05). This is the first comprehensive mobility study in five years, and designed to identify U.S. airlift needs up to the year 2005. MRS-05's principal finding is that the goal set by the last mobility study, for an airlift fleet capable of moving 49.7 million ton miles per day (MTM/D) of personnel and cargo, is inadequate to meet the current national military strategy. MRS-05 recommends an airlift fleet capable of 54.5 MTM/D. It says that DOD needs 51.1 MTM/D of lift capacity to fight and win two nearly simultaneous major theater wars (MTWs). Three additional missions are of the highest priority, and require an additional 3.4 MTM/D of lift capability: conducting special operations, deploying theater missile defenses, and supporting non-combat theaters. DOD's current strategic airlift capability is approximately 44.7 MTM/D, which is 5.0 MTM/D short of the 1995 goal, and nearly 10 MTM/D short of the MRS-05 goal.

AMC identified a number of missions and scenarios that would require up to 67 MTM/D of airlift capability. However, it recommended, and the Chairman of the Joint Chiefs of Staff and the Service Chiefs agreed, that 54.5 was the "minimum-moderate risk capability."

## Some Options

At least five approaches have been suggested that might be pursued to address DOD's airlift capabilities and needs. Each option has strengths and weaknesses. These options are not mutually exclusive, and some might be pursued concurrently.

**Option 1: Modernize C-5s and Purchase Additional C-17s.** The Air Force is considering the purchase of additional C-17s and is also pursuing the extension of the C-5's life through engine and avionics modernization programs. At issue is how many more C-17s to purchase and how many C-5s to upgrade. The current Air Force plan is to upgrade all C-5s. Some have argued that only the C-5Bs should be upgraded and the C-5As should be retired.

	Modernize C-5 Fleet	Buy More C-17s
Cost Estimate <sup>8</sup>	\$91M each	\$334.2M each
Production Rate	12 aircraft/ year	approx 12 aircraft/year
Aircraft Life Remaining	29,000 hours	30,000 hours
Maximum Load	291,000 lbs	160,000 lbs
Mission Capable Rate	approx 75%	78.6 - 85.9%
Direct Delivery Capability	No	Yes

---

<sup>8</sup> *Selected Acquisition Report (SAR) Summary Tables*, Department of Defense OUSD(AT&L) Apr. 2, 2004. As of Date: December 31, 2003. Total acquisition cost estimate. Assumes 180 aircraft buy for C-17 and 112 aircraft modifications for C-5.

Cost is an important factor to consider when choosing between these three alternatives, as is performance. The table above summarizes some of the factors to be weighed. Five additional factors merit discussion. First, the C-17 is the only U.S. strategic airlifter still in production. Purchasing additional aircraft beyond what is currently programmed would extend the production line's life, and may offer industrial base benefits. Second, purchasing additional C-17s and allowing the C-5 fleet to atrophy would lead to a homogeneous fleet. Some voice concern that a fleet composed entirely of one model of aircraft is less robust than a fleet composed of two types of aircraft. If one type of aircraft is grounded, the other can still fly. Others argue that homogeneous fleets offer potentially significant savings in operations and maintenance costs, and that the U.S. theater lift fleet has been almost entirely composed of one type of aircraft, the C-130, for years. Third, while the C-5 may have many hours of life remaining, it is an older aircraft than the C-17. Proponents of purchasing additional C-17s point out that this aircraft exploits newer technology that will make it easier and cheaper to maintain than the C-5, and offers greater opportunities for future upgrades and modernization. Fourth, the C-5's unique ability to carry very large equipment such as engineering equipment and Patriot missile batteries must be considered. DOD's C-5 inventory has not met demands to transport oversize/oversize cargo. Therefore, between 2003 and 2004, DOD contracted with Russia to provide the AN-124 heavy lift aircraft to fly over 200 missions.<sup>9</sup> Finally, the C-5 carries almost twice the payload of the C-17. Eliminating the 120 C-5s from the inventory removes the capacity of roughly 218 C-17s.

**Option 2: Increased Use of Commercial Aircraft.** Considering the current shortfall in military strategic airlift capability, DOD may wish to consider increased use of commercial aircraft, which offer many advantages over dedicated military aircraft. They are numerous, tend to have longer range, and they are less expensive than military aircraft. However, civilian aircraft also have limitations. They can't carry oversize or outsize cargo, they can't conduct special missions like airdrops, or support special operations. Also, they tend to congest airfields due to longer ground times, cargo handling equipment requirements, lack of roll on/roll off capability, and less ramp maneuverability.

It may be that DOD is already exploiting commercial aircraft to the maximum potential benefit. The Air Force indicates in the MRS-05 study that they couldn't use the 20.5 MTM/D of civilian airlift capability assigned for most of the halt phase of the wartime scenarios studied, due to the limitations listed above. Also, enemy use of weapons of mass destruction, such as chemical weapons, effectively deters civilian crews from entering conflict areas. One civil aircraft initiative that may have some utility for the military is the effort by Boeing, with the Air Force's endorsement, to market a civilian version of the C-17. Adding this aircraft to the Civil Reserve Air Fleet would address the shortcomings listed above. Whether there is a sufficient market for these aircraft to be commercially viable remains to be seen.

**Option 3: Pursue Airships or Hybrid Airships.** The Army, Navy, Joint Staff and Defense Advanced Research Projects Agency (DARPA) are all exploring the

---

<sup>9</sup> Gene Rector, "Russian Aircraft Getting U.S. C-5 Work," *Macon Telegraph*, Dec. 21, 2003. Cynthia Di Pasquale, "Russian Planes Expand U.S. Airlift Capability Strained During OIF, OEF," *Inside the Air Force*, Apr. 2, 2004.

development and use of airships, or hybrid airships, to carry very large military payloads long distances. Airships, also called blimps, typically use helium to achieve lift and often resemble the elongated, cigar-shaped *Goodyear* blimp seen at major sporting events. Hybrid airships also use gas buoyancy for much of their lift, but are shaped like an aircraft wing to generate additional lift from aerodynamic forces. The airships currently being explored could potentially carry payloads on the order of 500 tons to intercontinental distances at speeds up to 100 miles per hour.<sup>10</sup>

In addition to their very large payloads and long range, airships and hybrids may offer additional advantages applicable to the strategic airlift mission. They do not appear to require as expensive and as specialized infrastructure as aircraft, and may be able to deliver their payloads near the conflict, rather than an port or airfield miles to the rear. Airships may potentially be capable of carrying a complete brigade-sized ground unit and its equipment directly from “the fort to the fight,” overcoming logistic choke points and mitigating the effects of limited forward basing. Airships and hybrids may be able to land on water,<sup>11</sup> which could prove valuable in realizing the Department of the Navy’s sea basing concept.

**Option 4: Reduce the Airlift Requirement.** Another method for addressing current and forecast airlift shortfalls is to reduce the size, weight or amount of equipment to be moved. As part of their efforts to achieve a military transformation, all four services are exploring ways to become lighter, leaner, or more deployable.

A key facet of the Army plan is the Stryker Brigade Combat Team. It is composed of a mechanized infantry brigade of 3,500 personnel. Equipment will include 327 Stryker vehicles — which are lighter than today’s tanks — almost 600 wheeled vehicles, 155MM self-propelled artillery, air defense weapons, and engineering equipment. The Army wants to be able to move one Stryker Brigade anywhere in the world in 96 hours. It also wants to deploy one division in 120 hours and five divisions in 30 days. Presumably, a variety of pre-positioning and transportation modes would be exploited to meet this goal.

The Air Force’s principal effort in organizational innovation is the Expeditionary Air Force Concept, or EAF. The purpose of the EAF is provide a structured and more responsive way to deploy capabilities. The EAF will organize much of the Air Force into 10 Aerospace Expeditionary Forces (AEF) that will include combat, mobility, and combat support forces. Each AEF includes approximately 175 aircraft, 20,000 people, and 6,000 tons of deployable equipment. The goal is to deploy one AEF anywhere in the world in 48 hours and up to five AEFs in 15 days.

Although both of these organizational initiatives appear to have merit, it is not clear that either will reduce demands on the strategic airlift fleet. The amount and weight of equipment in a Stryker brigade, for example, may be less than in current Army organizations, but the desired speed of delivery is greater. Air Force analysts estimate that

<sup>10</sup> Rich Tuttle, “DARPA Moves Ahead on Walrus,” *Aerospace Daily*, Apr. 17, 2004. Anne Roosevelt, “U.S. Military Considers Huge Airships for Lift Needs,” *Defense Week*, Aug. 13, 2001.

<sup>11</sup> Chuck Myers, “HULA: A Helium Magic Carpet?” *Proceedings*, U.S.N.I., June 2003.

the early delivery of a Stryker Brigade and an AEF would require more airlift than moving legacy forces during the halt phase of one MTW over a lengthier amount of time. Also, moving five Army divisions in 30 days may require more airlift than currently planned for the halt phases of two MTWs.<sup>12</sup> The net effect the Service's plans to become lighter, leaner and more deployable may have on airlift may merit increased attention.

**Option 5: Accept less Strategic Airlift Capability.** The final option that may be considered is to operate within the current and projected airlift capabilities. There appear to be at least three arguments for this approach. First, there is some debate over the realism of MRS-05's plan for supporting two nearly simultaneous MTWs. General Ryan, for instance, was quoted saying "We will never have enough for two MTWs. I don't think we can afford it. We have a one-major theater war airlift force."<sup>13</sup> General Walter Kross, former commander of the Transportation Command also said "the airlift force available for the next decade will be one that can handle a single major regional contingency."<sup>14</sup> Furthermore, the actual U.S. airlift capabilities have been short of the stated MTM/D requirement for 11 of the last 13 years.<sup>15</sup> During this time, the United States has successfully conducted operations in South West Asia, Bosnia and Kosovo. It can thus be argued that the airlift requirement set by MRS-05 and other studies is greater than required. A counter argument is that airlift requirements are designed to satisfy a worst case scenario. Adherents to this perspective say the 54.5 MTM/D requirement is justified, and the United States has been fortunate over the last 13 years not to have faced the worst case scenario, in which case its airlift shortfall would have been detrimental.

Second, it is argued that the MTM/D requirement can be lowered because strategic airlift capacity is not the limiting deployment factor. Instead, the ability to move forces may be limited by too few airfields and inadequate airfield infrastructure. Therefore, acquiring more strategic airlifters might not only fail to satisfy airlift shortcomings but employing them could actually exacerbate deployment problems. In Operation Allied Force, for instance, "there were not enough air bases in the area immediately around Kosovo to support all the aircraft..."<sup>16</sup> This finding is significant because this theater contains numerous airbases relative to other regions. Also, a study by the Army's Military Traffic Management Command found that the biggest roadblock to achieving the service's deployment goals is the limited infrastructure at forward airfields.<sup>17</sup> Examples of infrastructure shortfalls include limited ramp space and loading/unloading equipment.

<sup>12</sup> Conversation with Air Mobility Command, SAF (LLW) and Department of the Air Force, Deputy Chief of Staff for Plans and Programs, Global Mobility Division, Apr. 5, 2000.

<sup>13</sup> Linda de France, "Ryan: We Will Never Have Enough Lift for Two Regional Wars," Aerospace Daily, June 22, 2000.

<sup>14</sup> John Tirpak, "New Boss at Air Mobility Command," *Air Force Magazine*, Mar. 1997, p. 36.

<sup>15</sup> Presentation by Brig. Gen. Robert Bishop to congressional staff, *Airlift Portion of MRS-05*, Slide #8, "Comparing Capabilities to Requirements," Mar. 28, 2001.

<sup>16</sup> *Kosovo After Action Review*. Secretary of Defense William S. Cohen and Gen. Henry H. Shelton, Chairman of the Joint Chiefs of Staff. Senate Armed Services Committee, Oct. 14, 1999.

<sup>17</sup> Kim Burger, "Army Study: Poor Forward Airfields Jeopardize Deployment Goals," *Inside the Army*, Aug. 21, 2000.